AMENDMENTS TO THE DRAWINGS

Amendments to Figure 1

Figure 1 has been amended to remove the energy source 8 and energy pulses 6 included in Applicant's reply of April 4, 2005. The amended Figure 1 corresponds to the version of Figure 1 originally filed with the application.

Amendment of Figure 3

Applicant cancels Figure 3 that was submitted in Applicant's reply of April 4, 2005.

REMARKS

The Office Action of June 3, 2005, is discussed in detail below.

Drawings

From Paragraph 1 of the Office Action:

Replacement drawings were received on April 4, 2005. These drawings are unacceptable because they constitute new matter.

Applicant made a good faith effort to comply with the drawing requirement stated in the Office Action of October 6, 2004, in Applicant's reply of April 4, 2005; disagrees with the Examiner's objections to the drawings submitted in Applicant's reply of April 4, 2005; and believes those drawings include no new matter. Applicant further notes that the Examiner has failed to point to specific portions of the drawings that constitute new matter.

Applicant further believes, pursuant to the comments that follow, that amended drawings as requested by the Examiner in the Office Action of October 6, 2004, are not required and requests that the objection to the original drawings be removed.

As to Figure 1, in the Office action of October 6, 2004, the Examiner requested that Applicant show the plurality of energy pulses recited in claims 1 and 13. Applicant respectfully maintains that the plurality of energy pulses recited in claims 1 and 13 are adequately described in Applicant's original specification and Figure 1. Applicant's specification makes frequent reference to the use of a plurality of energy pulses to form marks (see, for example, p. 8, lines 15 – 19 and p. 9 line 22 – p. 10, line 2) and the use of energy pulses to form marks in a phase change material is well understood by those of skill in the art. Applicant maintains that the specification and Figure 1 adequately describe the

formation of marks with energy pulses and that energy pulses are not a structural detail of sufficient importance to include in a drawing.

As to Figure 3, Applicant is surprised by the Examiner's insistence on the inclusion of a drawing showing the elements of a method claim (claim 26). Since the application was accorded a filing date, the Examiner is presumably relying on the second sentence of 35 USC 113 as the basis of the rejection – "When the nature of such subject matter admits of illustration by a drawing and the applicant has not furnished such a drawing, the Commissioner may require its submission within a time period of not less than two months from the sending of a notice thereof." (MPEP 608.02) Applicant recognizes a need to illustrate structural features of a claim in order to facilitate the understanding of an invention directed at an apparatus or other object and notes that this view has been expressed in MPEP 608.02(d) – "Any structural detail that is of sufficient importance to be described should be shown in the drawing."

Applicant fails to see, however, how a method claim "admits of illustration by a drawing" and notes that the Examiner has failed to explain how claim 26 of Applicant's application admits of illustration by a drawing. Applicant further notes that, to the best of his knowledge, the MPEP is silent as to whether drawings are required for method claims. The steps of a method claim are in most cases simply not amenable to convenient representation in pictorial or graphical terms. Applicant's claim 26 is a good case in point. The claim includes three basic steps: An "applying energy" step; a "forming mark" step; and a "dissipating energy" step. Applicant maintains that such steps do not admit of illustration by a drawing and notes that the Examiner has provided no guidance as to how Applicant can comply with the requirement to provide a drawing for claim 26. How would the Examiner draw "applying energy", "forming mark" and "dissipating energy"?

Applicant also believes that claim 26 and the specification constitute a sufficient description of the method claimed in claim 26 and that claim 26 includes no structural detail of sufficient importance to include in a drawing. The spatial profile element of claim 26 is described in clear terms in the specification on p. 16, line 19 – p. 17, line 7. The region of spatial overlap element of claim 26 is described in clear terms in the specification on p. 17, lines 7 – 16. The temperature profile element of claim 26 is described in clear terms in the specification on p. 19, lines 14 – 19. The formation of a mark element and temperatures sufficient to permit formation of an amorphous phase element of claim 26 are described in clear terms in the specification on p. 18, line 22 – p. 19, line 13. The dissipating excess energy element of claim 26 is described in clear terms in the specification on p. 26, line 18 – p. 27, line 18 and p. 30, line 19 – p. 31, line 10. Applicant believes that each of the elements of claim 26 depicts a commonly understood and well-recognized physical concept to persons of skill in the art of optical disks and that none of the elements requires a pictorial representation to appreciate its significance.

<u>**Specification**</u>

From Paragraph 2 of the Office Action:

The amendment filed April 4, 2005 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure.

Applicant has canceled the paragraphs on page 3 (last paragraph) and page 5 (last paragraph), the additional text on page 4 in paragraph 1, the addition of elements to Figure 1 and Figure 3 referred to by the examiner in Paragraph 2 of the Office Action.

Claim Rejections

From Paragraph 4 of the Office Action:

Claims 26, 27, 31-34 & 38-42 are rejected under 35 U.S.C. 102(e) as being anticipated by O'Neill et al. (hereafter O'Neill) (US 6,775,218)

Applicant notes that the Examiner has stated in Paragraph 9 of the Office Action of June 3, 2005 that Applicant's arguments filed April 4, 2005 were considered but were found not persuasive. Applicant provides the following further comments and directs the comments to the subparagraphs of Paragraph 9. Applicant believes that the following further comments, in combination with Applicant's arguments filed April 4, 2005, overcome the rejection based on the O'Neill reference.

Paragraph 9a

Applicant continues to maintain that Applicant's region of spatial overlap corresponds to region 302 of Fig. 3A of O'Neill. Applicant's specification (p. 17, lines 10 – 12) clearly states that the region of spatial overlap corresponds to the portion of the phase change material that is illuminated as the optical energy propagates through the material. Region 302 of O'Neill is the region illuminated in O'Neill. Region 301 of O'Neill is the region over which the mark is formed upon cooling of the phase change material and is a subset of the region of spatial overlap.

Paragraph 9b

Applicant continues to maintain that O'Neill fails to teach the formation of a mark that coincides with those portions of the spatial distribution of energy having a temperature

sufficient to form an amorphous state. Fig. 3A does not show "formation of a mark" as indicated by the Examiner, but rather shows a region 301 that corresponds to a mark after it has been formed. The mark region 301 corresponds to the stable, cooled state of the mark and Fig. 3A is unconcerned with the transient period between the time of initial illumination and ultimate cooling to form a mark.

The Examiner has a misconception about Fig. 2 of O'Neill. Fig. 2 of O'Neill does not show a spatial distribution of temperatures within the phase change material as argued by the Examiner (Paragraph 4 of the Office Action: "... said energy providing a temperature profile (figure 2) within said region of spatial overlap ..."). Instead, Fig. 2 shows some possible time responses of a phase change material under the assumption that it is being cooled from a temperature above Tm. Curves 201 and 202 of Fig. 2 show two distinct cooling responses for a given region of phase change material heated to a temperature above Tm. Depending on the dynamics of the cooling process, the particular portion of the heated phase change material can proceed along curve 201 or curve 202. Characteristics such as mark size will depend on the details of the cooling process and different mark sizes are possible, depending on the precise nature of the cooling process, from a given heated state of the phase change material.

Note the axes of Fig. 2 of O'Neill – Temperature and Time. Fig. 2 does not provide a depiction of the spatial variation of temperature across a phase change material. It is intended to operate from the assumption that a portion of a phase change material has been heated to a temperature above Tm, but does not depict which portions of the phase change material has been heated to such a temperature and more importantly, does not depict how the temperature varies at different spatial positions within an illuminated portion of a phase change material. The temperature profile of Applicant's claim 26 is a characterization of

how temperature varies at different spatial positions of an illuminated portion of phase change material (p. 19, lines 17 – 19 of Applicant's specification: "The temperature profile describes the spatial distribution of temperatures attained at positions within the phase change material as a consequence of the applied energy.")

When a phase change material is illuminated with a beam, some portions of the phase change material will be heated to a temperature of Tm or above. (Typically, this heated portion would correspond to a circular portion centered at the center of the illuminating beam and having a radius less than the radius of the illuminating beam.) Each point within this heated portion can undergo cooling as depicted by one of the cooling curves shown in Fig. 2 of O'Neill. Upon conclusion of the cooling process, a mark forms. The relationship between the boundaries of the mark in the cooled state and the boundaries of the portion of the phase change material heated to temperatures at or above Tm of O'Neill depends on nature of the cooling process. It is this relationship that O'Neill fails to teach.

O'Neill states: "When the beam irradiates a portion of a disc, the central region tends to melt the phase change material. If the beam is then turned off, the melted material tends to cool quickly and form an amorphous region of material (as illustrated by region 301)" (Col. 7, lines 3 – 7 of O'Neill). O'Neill fails to teach the relationship between the boundaries of the melted portion of the phase change material and the boundaries of the mark. O'Neill and the prior art generally fail to teach this relationship. In the absence of a strategy to control the relationship, the size of the mark formed after cooling will be different from the size of the region initially heated to a temperature at or above Tm. This follows because of the need to dissipate heat away from the portion of the phase change material initially melted by the illuminating beam. Consider, for example, the situation of O'Neill's Fig. 2 where the cooling curves 201 and 202 initiate at a maximum temperature

that exceeds Tm. Since a temperature of only Tm is needed to maintain the melted state, the excess thermal energy represented by the temperature in excess of Tm is available to effect transformations in other portions of the phase change material. (p. 21, lines 6 – 9 of Applicant's specification: "The energy directly added to specific positions or regions of a phase change material does not remain at those positions or within those regions indefinitely, but rather may be transported to other positions or regions in the phase change material.")

In particular, dissipation of this excess energy can occur from a portion of the phase change material heated to a temperature at or above Tm to a peripheral portion of the phase change material that has not been heated to a temperature of Tm. (p. 21, lines 11 – 14 of Applicant's specification: "The net effect of energy transport is a redistribution of energy from regions of high energy to regions of low energy. Thermal energy, for example, flows from regions of high temperature to regions of low temperature.") If this peripheral portion of the phase change material is below Tm and receives sufficient thermal energy due to dissipation from regions heated to hotter temperatures by the irradiating beam, its temperature can be elevated above Tm even though it was not heated to a temperature of Tm or above by the illuminating beam. When a peripheral portion of the phase change material that has been so heated cools, the possibility of forming an amorphous phase beyond the boundaries of that portion of the phase change material heated to a temperature of Tm or above by the illuminating beam arises and this has the effect of creating an amorphous mark upon cooling having boundaries that extend (in an unpredictable way) beyond the boundaries of the region initially heated to a temperature of Tm or higher by the beam. (p. 27, lines 15 – 18 of Applicant's specification: "These effects may occur if the dissipated energy is of sufficient duration and magnitude to increase the temperature of

portions of the phase change material outside the desired boundaries of the mark to a temperature sufficient to form an amorphous phase.") It is thus incorrect to conclude that the boundaries of O'Neill's mark region 301 obtained after cooling coincide with that portion of the phase change material heated to a temperature of Tm or above by the illuminating beam. Additional factors such as back-crystallization and recrystallization further complicate the boundaries of the mark. General considerations related to the dissipation of excess energy are central to the notion of "thermal budget" as articulated in Applicant's specification. (See the discussion extending from p. 21, line 4 through p. 29)

Applicant's invention teaches that the mark size coincides with that portion of the phase change material initially heated to a temperature at or above Tm. Applicant achieves his invention through the control of the relative contributions of the capacitive and conductive mechanisms to the cooling process through a low thermal budget recording process as indicated in Applicant's specification. O'Neill fails to teach a relationship between the boundaries of his initially melted portion of the phase change material and the boundaries of the mark formed upon cooling and further provides no teaching of the requisite control of the cooling process needed to achieve the invention of Applicant's claim 26.

Paragraph 9c

The Examiner states that Applicant's claimed language is not commensurate with features that Applicant maintains are not taught by O'Neill. For reasons stated above, Applicant believes that the claimed language does teach the features lacking in O'Neill. The claim language indicates that mark formation occurs in that portion of the phase change material that are within the portion of the temperature profile provided by the applied energy that enable formation of an amorphous phase and that any excess energy

within that portion of the phase change material is dissipated away from that portion of phase change material in such a way that no further formation of an amorphous phase occurs in other parts of the phase change material. Applicant believes that the claimed language adequately distinguishes over the teaching of O'Neill.

SUMMARY

In view of the above remarks, the outstanding claims in the application are claims 26 – 42. Applicant believes that all outstanding claims are allowable over the O'Neill reference cited by the Examiner and also believes that the new matter objections of the Examiner have been addressed by this reply. Applicant believes that the application is in a condition for allowance.

If the Examiner has questions or suggestions regarding these remarks or the application, he is respectfully asked to contact applicant's representative at the telephone number or email address listed below.

Respectfully submitted,

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